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United States Department of Agriculture,

BUREAU OF CHEMISTRY—Circular No. 14.

H. W. WILEY, Chief of Bureau.

ORGANIZATION OF THE BUREAU OF CHEMISTRY.

[Revised to July 1, 1909.]

GENERAL STATEMENT.

For practical administration and for the economical arrangement of its work the Bureau of Chemistry is divided into divisions and laboratories according to the questions which are to be studied and the classes in which the work can be most conveniently arranged. The purpose and scope of the Bureau are best described by stating briefly the work done in each division and laboratory.

The ground covered by the investigations of the Bureau of Chemistry in past years is marked out by its publications, a list of which is included in this circular. It is the aim of the Bureau of Chemistry to confine its attention to questions of agricultural chemistry that are of public interest and to such other chemical investigations as may be referred to it by other Departments of the Government. Inquiries which are of value to individuals only, or to a small group of individuals, can not be taken up. Investigations of plans and processes which are of use only to a manufacturer requesting such investigations can not be made. On the other hand, where such investigations may result to the advantage of the public in general, and not especially to a single individual or group of individuals, such work may be undertaken.

In general, the Bureau is unable to examine miscellaneous samples sent to it for that purpose. Samples of foods, waters, soils, drugs, and other miscellaneous samples are received from time to time with a request for their analysis, but such requests are usually denied, as their number and the time the work would require make it impracticable for the Bureau to comply with them.

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ORGANIZATION OF BUREAU OF CHEMISTRY.

H. W. WILEY, *Chemist and Chief of Bureau.*

F. L. DUNLAP, *Associate Chemist.*

W. D. BIGELOW, *Assistant Chief of Bureau.*

F. B. LINTON, *Chief Clerk.*

A. L. PIERCE, *Editorial Clerk.*

M. W. TAYLOR, *Librarian.*

Division of Foods, W. D. BIGELOW, *Chief.*

Food Inspection Laboratory, L. M. TOLMAN, *Chief.*

Food Technology Laboratory, E. M. CHACE, *Chief, and Assistant Chief of Division.*

Oil, Fat, and Wax Laboratory, H. S. BAILEY, *Chief.*

Division of Drugs, L. F. KEBLER, *Chief.*

Drug Inspection Laboratory, G. W. HOOVER, *Chief.*

Synthetic Products Laboratory, W. O. EMERY, *Chief.*

Essential Oils Laboratory, *under Chief of Division.*

Pharmacological Laboratory, Wm. SALANT, *Acting.*

Chief Food and Drug Inspector, W. G. CAMPBELL.

Miscellaneous Division, J. K. HAYWOOD, *Chief.*

Water Laboratory, W. W. SKINNER, *Chief.*

Cattle-Food and Grain Laboratory, G. L. BIDWELL, *Acting.*

Insecticide and Fungicide Laboratory, C. C. McDONNELL, *Chief.*

Trade Wastes Laboratory, *under Chief of Division.*

Contracts Laboratory, P. H. WALKER, *Chief.*

Dairy Laboratory, G. E. PATRICK, *Chief.*

Food Research Laboratory, M. E. PENNINGTON, *Chief.*

Leather and Paper Laboratory, F. P. VEITCH, *Chief.*

Microchemical Laboratory, B. J. HOWARD, *Chief.*

Sugar Laboratory, A. H. BRYAN, *Chief.*

Nitrogen Section, T. C. TRESCOT, *in Charge.*

Special Investigations:

Physiological Chemistry (Animal), F. C. WEBER, *in Charge.*

Physiological Chemistry (Vegetable), J. A. LE CLERC, *in Charge.*

Bacteriological Chemistry, G. W. STILES, *in Charge.*

Enological Chemistry, W. B. ALWOOD, *in Charge.*

Food and Drug Inspection Laboratories:

Boston, B. H. SMITH, *Chief.*

Buffalo, W. L. DUBOIS, *Acting.*

Chicago, A. L. WINTON, *Chief.*

Cincinnati, B. R. HART, *Acting.*

Denver, A. E. LEACH, *Chief.*

Detroit, H. L. SCHULZ, *Acting.*

Galveston, T. F. PAPPE, *Acting.*

Honolulu, Hawaiian Islands, R. A. DUNCAN, *Acting.*

Kansas City, Mo., A. V. H. MORY, *Acting.*

Nashville, R. W. BALCOM, *Acting.*

New Orleans, C. W. HARRISON, *Chief.*

New York, R. E. DOOLITTLE, *Chief.*

Omaha, S. H. ROSS, *Acting.*

Philadelphia, C. S. BRINTON, *Chief.*

Pittsburg, M. C. ALBRECHT, *Acting.*

Portland, Oreg., A. L. KNISELY, *Acting.*

St. Louis, D. B. BISBEE, *Acting.*

St. Paul, A. S. MITCHELL, *Chief.*

San Francisco, R. A. GOULD, *Chief.*

Savannah, W. C. BURNET, *Acting.*

Seattle, H. M. LOOMIS, *Acting.*

INSPECTION OF DOMESTIC AND IMPORTED FOODS.

[Under the food and drugs act, June 30, 1906.]

BOARD OF FOOD AND DRUG INSPECTION.

The Board of Food and Drug Inspection is a departmental board. Its work, however, is so closely related to the work of the Bureau of Chemistry that it is proper here to describe its organization, functions, and personnel.

The board was created by the Secretary of Agriculture on April 25, 1907, through General Order No. 111. The duties of the board are to consider all questions arising in the enforcement of the food and drugs act of June 30, 1906, upon which the decision of the Secretary of Agriculture is necessary; to consider and supervise all correspondence involving interpretations of the law and questions arising under the law; and to conduct all hearings based upon alleged violations of the food and drugs act of June 30, 1906. The Bureau of Chemistry is charged under the act to perform whatever analytical work may be required for the information of the board. The board reports directly to the Secretary. The personnel is as follows: H. W. Wiley, Chemist and Chief of Bureau, chairman; F. L. Dunlap, Associate Chemist, and G. P. McCabe, Solicitor of the Department.

WORK OF THE BUREAU.

While all of the divisions and laboratories of the Bureau cooperate to a greater or less degree in the analytical work contingent upon the inspection of foods and drugs, the Bureau organization directly concerned in the administration of the law is as follows, the personnel being shown in the list on page 2:

The Division of Foods is in charge of the analytical work on foods performed at the central Bureau in the enforcement of the law, and makes check analyses on doubtful samples referred to it by the food and drug inspection laboratories and renders the final decision as to the analytical results. The Division of Drugs performs the same work in regard to drugs, medicines, etc. The chief of the Division of Foods, who is also Assistant Chief of Bureau, installs the inspection laboratories and has charge of the administrative detail in connection with their work, although the chiefs of these laboratories report directly to the Chief of Bureau, who is charged by the Secretary with the details of Bureau administration involved. The pro-

cedure followed at the central Bureau and at the inspection laboratories in enforcing the law is given in detail under the heading, "Division of Foods."

The corps of 39 inspectors, under a Chief Inspector, who reports directly to the Chief of Bureau, has headquarters at Washington, and the inspectors receive their directions from and make their reports to the Chief Inspector at that place. The inspection of factories and the taking of samples for analysis constitute their chief duties.

Aside from the other inquiries mentioned, the Division of Foods studies analytical methods necessary for the examination of food. This work is partly done in collaboration with the Association of Official Agricultural Chemists, of which the Chief of the Bureau is the secretary. This division is also engaged in collaborative work with the pomologist of the Bureau of Plant Industry on the study of the ripening of fruit. Special studies are made from time to time of the influence of methods of manufacture and other conditions upon the composition and wholesomeness of food, with respect to the enforcement of the food and drugs act.

FOOD INSPECTION.

The work in connection with the enforcement of the food and drugs act, June 30, 1906, naturally divides itself into two portions: First, the inspection of foods and drugs sold in the District of Columbia and the Territories or shipped in interstate commerce; second, the inspection of foods imported into the United States from foreign countries. In connection with food-inspection work branch laboratories are maintained at twenty-one leading commercial centers, the list being given on page 2. The samples of foods collected in the vicinity of Washington are examined in the food-inspection laboratory of the Division of Foods, in which laboratory the results of the branch laboratories on condemned samples are also checked.

DIVISION OF FOODS.

W. D. BIGELOW, *Chief.*

E. M. CHACE, *Assistant Chief.*

The Division of Foods is charged with the general food investigations made by the Bureau. In the past much work has been done with various kinds of food purchased in the open market, in order to determine their purity and the character of adulteration commonly practiced. Careful attention has long been given to this subject under the provisions of the appropriation act authorizing the Bureau of Chemistry to investigate the adulteration, false labeling, and false branding of food products.

By orders taking effect on July 1, 1908, there were established in the Division of Foods the following laboratories with the functions specified:

(1) *Food Inspection Laboratory* (L. M. Tolman, Chief), charged with the examination of samples taken in connection with the enforcement of the food and drugs act, except those referred to or coming within the scope of other laboratories.

(2) *Food Technology Laboratory* (E. M. Chace, Chief), charged with the investigation of technical methods connected with the manufacture and preparation of foods, and the conduct of the analytical work necessary, for which no other provision has been made.

(3) *Oil, Fat, and Wax Laboratory* (H. S. Bailey, Chief), charged with the investigation of methods for the preparation and purification of edible oils, fats, and waxes and the study of analytical methods for the determination of their quality and purity.

Domestic foods.—Samples of foods and drugs are obtained in the open market by the inspectors of the Bureau and by them transmitted to the Bureau of Chemistry in Washington or to one of the branch laboratories.

No report is made regarding samples which are found to comply with the law or cases which for any reason are not to be prosecuted. In the case of samples which are in violation of the law, and concerning which the evidence is considered sufficient to warrant prosecution, a notice is sent to the dealer or shipper appointing a date of hearing and affording him an opportunity to make such statement of fact as he may desire before the Secretary of Agriculture or such person or persons as the latter may designate. Usually such hearings are before the Board of Food and Drug Inspection or the chief of a branch laboratory. Decision not to prosecute may be due to the fact that a new question is raised by a particular sample, to irregularity in sampling, to loss of sample in transmission, or to other conditions that have no connection whatever with the legality of the sample in question. After the conclusion of the hearing all samples the accuracy of whose analysis is questioned by the dealer or manufacturer are reexamined in another laboratory than that in which the original examination was made. If it then appears that the law has been violated, the matter is referred to the Solicitor of the Department, who prepares the case for transmission by the Secretary of Agriculture to the Attorney-General for prosecution by the United States attorneys. In the case of foods and drugs liable to seizure and condemnation, the facts are reported directly to the United States attorneys by the Secretary.

Adulterated and misbranded foods falling within the jurisdiction of the law may also be seized and disposed of by destruction or sale as the court directs. The owner may, however, in the discretion of the court, regain possession of the goods by paying the costs and giving a bond stipulating that the articles will not be disposed of contrary to the act or the laws of any State, Territory, district, or insular

possession. Notices of judgments of the courts are published, in the form of circulars, from the office of the Secretary, giving the findings of the analyst and of the court, in accordance with Regulation 6.

Imported foods.—The inspection of imported foods began July 1, 1903, under the law of March 3, 1903, the provisions of which have been included in the food and drugs act, June 30, 1906. The Secretary of Agriculture is authorized to inspect all imported food products, including under this head what are known generally as foods, beverages, condiments, and ingredients used in the manufacture thereof. Every invoice of food products coming into this country is accompanied by a declaration made before a United States consul concerning the character of the shipment. The law requires that each package of food products shall be correctly labeled or branded in regard to the nature thereof and the place of production or manufacture. It also provides that no substance deleterious to health shall be added to any food product, and that food products which are forbidden or restricted in sale in the country where made or from which exported shall not be admitted into the United States. In the execution of this law collaboration has been established with the State and Treasury Departments. Through the State Department our consuls are instructed to secure from intending shippers a full description of the character of the goods which they propose to send, in the form of a duplicate of the invoice. To this duplicate is attached a declaration made by the shipper to the effect that the food products covered by the invoice in question do not in any way differ from the character of such products required by the inspection law. This invoice and declaration are sent by fast mail direct to the Department of Agriculture. The Treasury Department collaborates in the execution of this law by securing samples of such invoices as may be suspected of being adulterated, misbranded, or of containing a deleterious substance. Samples of these goods are secured by the agents of the Treasury at the port of entry and forwarded to the Department of Agriculture for examination. Meanwhile the goods covered by the invoice are detained or removed under bond pending the result of the examination made by the Bureau of Chemistry. If the examination shows that the food products are of such a nature as to violate the provisions of the law, the importer is notified and an opportunity is given him to explain the matter. If the explanation is satisfactory, the invoice is released and the goods admitted; if not, the importer is required to reship the goods covered by the invoice beyond the jurisdiction of the United States. If this is not done within ninety days from the time of notification, the Secretary of the Treasury takes possession of the goods and destroys them under the provisions of a statute which has long been in force.

DIVISION OF DRUGS.

LYMAN F. KEBLER, *Chief*.

The Drug Laboratory was organized March 1, 1903, for the purpose of investigating the composition, adulteration, and false labeling or false branding of drugs and ingredients entering into the manufacture of such products and was made a division on January 1, 1908. In order to carry on the work more effectively, the following laboratories were established in the Division of Drugs on July 1, 1908:

Drug Inspection Laboratory, G. W. Hoover, Chief. This laboratory is charged with the examination of drugs sampled in connection with the enforcement of the food and drugs act, June 30, 1906, excepting those for which special arrangement is made at the branch laboratories. This includes a general investigation of drug products, bought on the market, to determine their standard composition and adulterants.

Synthetic Products Laboratory, W. O. Emery, Chief. This laboratory will investigate synthetic products and preparations containing them, develop methods for the analysis of organic synthesis, and study the preparation of organic compounds and their analysis.

Essential Oils Laboratory, under chief of division. It is the duty of this laboratory to investigate the essential oils and products in the manufacture of which the same are used. This necessitates studies relative to the chemical constitution and physical character of essential oils, the development of methods of analysis, and the improvement of those now existing; also the study of analytical processes for the examination of products containing essential oils.

Pharmacological Laboratory, Wm. Salant, in charge. The duty of this laboratory is to investigate the pharmacological action of drug products under the food and drugs act of June 30, 1906. This includes a study of the physiological and pathological effects produced on animals by the medicinal substances which enter into the composition of commercial drug products and by the derivatives and preparations of the same.

The prosecution of these studies requires the establishment of standards of purity and the development of methods for determining the same, without which it would be impossible to determine adulteration. When authorized standards exist, as in the case of many articles recognized by the United States Pharmacopœia, the medicinal remedies available on the market are examined for the purpose of ascertaining to what extent they comply with or deviate from such standards. The methods employed in determining the quality of medicinal agents are studied, and the data thus obtained are to be utilized in improving existing methods of analysis and in changing such standards as are found to be faulty or impracticable.

Especial attention is being given at present to the analytical methods used for testing potent plant drugs and products derived from them. As referee on medicinal plants and drugs of the Association of Official Agricultural Chemists, the chief of the Division of Drugs has undertaken systematic collaborative work with the pharmaceutical chemists of this country. Recognized methods for

assaying opium, cinchona, ipecac, and nux vomica have so far been studied and compared and the following drugs are being studied at this time: Belladonna leaves, belladonna root, coca leaves, colchicum corm, and colchicum seed.

A careful study of those medicinal remedies included in the United States Pharmacopœia for which there are no methods of analysis or recognized standards at present, and of some remedies not so recognized, is now in progress for the purpose of developing methods of analysis and acquiring data upon which uniform methods and standards of composition, quality, and strength may be based. The change of composition or deterioration, due to age or other causes, of crude drugs and finished products is also studied. Investigations of all drug products or medicinal agents for adulteration and misbranding under the food and drugs act, June 30, 1906, are made in this division or under its supervision, and similar investigations are also conducted in cooperation with the American Medical Association. A number of pharmaceutical chemists are stationed at the branch laboratories of the Bureau of Chemistry for the examination of drug products imported into the United States.

This division regularly examines chemical reagents purchased by the Bureau of Chemistry, first, for the purpose of securing trustworthy and reliable chemicals for analytical work; second, to obtain data which will serve in establishing standards; and, third, to place all contractors and competitors on an equal footing. As chairman of a committee on the testing of chemical reagents of the Association of Official Agricultural Chemists, the chief of the Division of Drugs collects data on the quality of chemicals furnished to analytical laboratories, to be used in formulating standards for chemical reagents. Analyses are also made for the Post-Office Department, and in other ways the officials are assisted in reaching conclusions relative to the fraudulent and dangerous nature of certain products sent through the mails.

Analyses of medicinal plants and other products are made for the Bureau of Plant Industry, and collaborative work on the investigation of the various cod-liver oils, beeswax produced under different conditions, and the influence of certain poisonous plants on the health of bees is also in progress. These investigations are conducted in collaboration with the Bureau of Entomology, the Bureau of Fisheries of the Department of Commerce and Labor, and the Division of Foods of this Bureau.

MISCELLANEOUS DIVISION.

J. K. HAYWOOD, *Chief*.

W. W. SKINNER, *Assistant Chief*.

This division and the four laboratories therein were formally organized by the Secretary under date of July 1, 1908, marking the logical growth and expansion of several lines of work, which were originally authorized in the Insecticide and Water Laboratory and reorganized under order of the Secretary, July 1, 1905, as the Miscellaneous Laboratory.

The principal lines of work are the examination and study of waters, cattle foods, forage crops, grains, insecticides and fungicides, trade wastes, and certain hygienic problems; also such miscellaneous chemical work of the Bureau of Chemistry and of other Bureaus and Divisions of various Departments of the Government as may be referred to this division and which does not properly belong to other established laboratories. For the convenient prosecution of the work the division is organized as follows:

WATER LABORATORY.

W. W. SKINNER, *Chief*.

The work on waters, originally organized under the Insecticide and Water Laboratory, has been expanded to include the chemical examination and study of mineral waters, irrigating waters, and waters for sanitary, technical, and domestic purposes. A study is being made of mineral waters from source and of the potable and medicinal waters found bottled upon the market for the purpose of securing data for the proper enforcement of the food and drugs act of June 30, 1906.

The examination of irrigating waters is made in collaboration with the Office of Irrigation Investigations of this Department, while chemical examinations of water supplies for sanitary, technical, and domestic purposes are made when the exigencies of the public service demand the same.

CATTLE FOOD AND GRAIN INVESTIGATIONS LABORATORY.

G. L. BIDWELL, *Acting Chief*.

To this laboratory are assigned investigations relating to the composition and nutritive value of feeds and forage crops; also the examination of commercial feeds for adulteration and the securing of data for the proper enforcement of the food and drugs act. In collaboration with the Office of Grain Investigations of the Bureau of Plant Industry, studies are made of the relative food value, milling and baking qualities, and general commercial importance of grains, together with the adaptability of certain grains to specific purposes.

A study of the chemical composition of forage crops of the arid and semiarid West is being made in collaboration with the Office of Farm Management, Bureau of Plant Industry, for the purpose of securing data to be used in the improvement of depleted ranges.

INSECTICIDE AND FUNGICIDE LABORATORY.

C. C. McDONNELL, *Chief*.

This laboratory studies the composition and methods of analysis of insecticides, fungicides, and weed killers, investigates improved methods of manufacture of these substances, and also studies the chemicals entering into their composition. There are being made, in collaboration with the Bureau of Entomology, experiments to determine the efficiency of certain insecticides and their effect upon foliage, and, in collaboration with several experiment stations, studies of more complete methods of analysis.

TRADE WASTES LABORATORY.

(Under Chief of Division.)

To this laboratory is assigned the work of investigating the effect of wastes from manufacturing operations upon animals, agricultural products, and forests. Special investigations are being made of the effect of smelter fumes upon plants and animals and the injury to vegetation and soils by the contamination of irrigating waters by mining wastes. The resistance of certain species of plants to the effect of salts of copper and arsenic, and to sulphur dioxid, is also being studied.

MISCELLANEOUS WORK.

(Under Chief of Division.)

The hygienic section makes investigations relating to the public health, the examination of poisonous substances in articles in common use, and the examination of the atmosphere of schools, public buildings, railroad cars, etc. Other miscellaneous work includes investigations of an official and public nature which may be properly made by the Bureau of Chemistry and which do not come within the province of other established laboratories.

CONTRACTS LABORATORY.

P. H. WALKER, *Chief*.

The Contracts Laboratory was organized July 1, 1903, for the purpose of examining materials submitted with bids or furnished on contract for the various Executive Departments and to do collaborative work provided for by law with other Departments which may request such assistance from the Secretary of Agriculture.

Among the more important lines of contracts work may be mentioned the investigation and examination of post-mark and canceling inks, inking pads, glue, glycerin, soap, lubricating oils, and linoleum used by the Post-Office Department; of disinfectants, lubricating oils, and coals used by the Government Hospital for the Insane; of dry colors, oils, glue, soap, steel, and miscellaneous supplies used by the Bureau of Engraving and Printing; of gums, oils, and alloys used by the Government Printing Office; of writing inks, typewriter ribbons, carbon papers, etc., used in the various Executive Departments where permanence of records is essential; of paints, oils, varnishes, chemical glassware and other apparatus used in the Department of Agriculture, and of supplies for the Commissary Office of the War Department and for the Isthmian Canal Commission, including paints, pigments, oils, metals, and miscellaneous supplies; of writing inks, typewriter ribbons, glue, soaps, oils, varnishes, paints, and miscellaneous supplies for the General Supply Committee, and of lubricating oils, paints, oils, colors, varnishes, and miscellaneous supplies for the Commissioners of the District of Columbia.

This laboratory, at the request of the Secretary of the Treasury, also examines a large number and variety of materials regarding which some question has arisen as to classification for dutiable purposes.

DAIRY LABORATORY.

G. E. PATRICK, *Chief*.

The Dairy Laboratory examines dairy products of every description and studies methods for making such examinations. A large part of the work at present is in connection with the enforcement of the food and drugs act of 1906, in the examination of interstate samples of milk, condensed milk, ice cream, butter, and cheese, to determine questions as to their adulteration and mislabeling. Also under the section of the same act referring to imported foods, this laboratory examines many samples of imported dairy products, mostly cheese, taken by the customs officers at the various ports of entry. Marked beneficial results are already shown in the improved quality of the cheeses imported from certain countries.

Chemical examinations are made of the samples of butter taken by the Bureau of Animal Industry in its enforcement of the law of 1902, regulating the manufacture and sale of renovated butter. All kinds of dairy products are also examined for the same Bureau in its general survey of American markets. Samples of dairy products received from other sources are analyzed when such work promises to be of public benefit.

New methods proposed for the analysis of dairy products receive critical study in this laboratory, both independently and in collaboration with the Association of Official Agricultural Chemists.

FOOD RESEARCH LABORATORY.

M. E. PENNINGTON, *Chief*.

The Food Research Laboratory was formally organized July 1, 1908, though it has existed as a laboratory for special investigations since April, 1907. It has investigated various problems connected with perishable foods, especially those involving chemical, bacteriological, and histological changes, all of these studies being conducted simultaneously, to afford a broad view of the subject under consideration. Originally the work was almost exclusively on changes occurring in foods when preserved by low temperatures, but gradually the scope has broadened until now it includes the study of decomposition and putridity in general, taking, for the present, poultry as the chief object of research. Such an investigation, if it be thorough, involves the study of the dressing, handling, transportation, warehousing, and selling of fowls. All of these avenues of information are being explored, with the most hearty cooperation and interest of the industry. Experiments to indicate the effect on the keeping quality of fowls after various methods of handling are inaugurated for the year 1909-10.

LEATHER AND PAPER LABORATORY.

F. P. VEITCH, *Chief*.

This laboratory was established on July 1, 1904, for the conduct of the following investigations:

Investigations of tannins and tanning materials and their effects upon the strength and properties of leather with a view to promoting the agricultural industries relating to the production of tannins and tanning materials and leather of a high quality.

All technical problems of a chemical nature relating to the production of tannins and tanning products especially, and investigations to determine the value and durability of various kinds of leather. Investigation and examinations of leathers for various purposes are made at the request of any of the Departments of the Government.

All chemical and physical investigations of papers in regard to their fitness for use in the Department of Agriculture and other Departments of the Government which may request such investigations; also the study of methods for improving the quality of papers and conserving paper-making materials in cooperation with the Bureau of Plant Industry and the Forest Service.

All technical problems of a chemical nature relating to the manufacture of paper, with a view to promoting the agricultural industries connected with the production of the raw materials, economy in their use, and the improvement of the quality of papers made.

Chemical-technical problems relating to the production, utilization, and composition of turpentine, rosins, and other gums and resins, including investigations of the coagulation of rubber latex and of the composition of rubber. Examinations of turpentine and rosin are made under the food and drugs act of June 30, 1906.

Technical-chemical investigations of the destructive distillation of woods, with reference to the utilization of waste woods and the increase of the various products obtained therefrom, and also investigations of other chemical uses of woods.

MICROCHEMICAL LABORATORY.

B. J. HOWARD, *Chief*.

This laboratory, which was organized July 1, 1904, aims to develop microscopical methods of analysis and apply them to the practical problems presented. Its activities are largely of a collaborative nature. This laboratory is charged with the microscopical and microchemical study of foods, drugs, cattle foods, paper and textile materials, miscellaneous agricultural products, etc. Special attention is given to the histological study of fruits, spices, cereals, starches, and other agricultural products, both on account of its scientific interest and for the purpose of perfecting methods for detecting the adulteration of these products. The laboratory makes microscopical examinations of the urine and blood in connection with the work on the influence of food preservatives on nutrition, performs the photomicrographic work of the Bureau, and cooperates with other branches of the Government in work of this character.

SUGAR LABORATORY.

[Under direct supervision of the Chief of Bureau.]

A. H. BRYAN, *Chief*.

The Sugar Laboratory is charged with the chemical study of the various sugars and other carbohydrates. Its work consists largely in the investigation of the domestic sirup industry, namely, the manufacture of sirup from maple sap, sorghum, and sugar cane.

During the present year the maple sirup and sugar industry has been especially considered. Chemical analyses have been made of numerous pure samples collected from the maple-producing sections of the United States and Canada. Much attention has been paid to the collection of the sap and its treatment, studying the effect of these factors on the appearance and composition of the finished product.

Having completed a study of American honeys, imported honeys are receiving consideration; also in collaboration with the bee

culture division of the Bureau of Entomology this laboratory is investigating the chemical changes occurring during the storage of honey and those produced by heating.

Another line of work is the examination of samples of sugar corn, grown in collaboration with the agricultural experiment stations and the Bureau of Plant Industry, to determine the effect of environment upon the sugar content. This work will be continued on other sugar-containing plants. This laboratory also makes all analyses of sugar beets sent to it by the Bureau of Plant Industry as a result of different lines of experimental work. It also analyzes samples of sugar cane grown in various sections of the country. In this connection, a study is made of the methods of determining sugar in beets and cane and other products of the sugar factory. An examination of beet molasses from a large number of sugar factories is in progress.

The laboratory collaborates with the International Commission for Uniform Methods of Sugar Analysis in the preparation of pure sucrose and the standardization of international quartz plates for the control of polariscopes in different countries, the chemist in charge being called upon to sit with this commission.

In connection with the work of the various divisions and laboratories of this Bureau, the Sugar Laboratory makes many examinations; the Contracts Laboratory referring to it all samples of dextrin, glucose, starches, and other carbohydrate material received from the Bureau of Engraving and Printing.

As referee on sugar for the Association of Official Agricultural Chemists, the chemist in charge cooperates in the study of methods for the analysis of sugar, molasses, sirup, and other carbohydrates.

NITROGEN SECTION.

All nitrogen determinations for the several laboratories and divisions are made in the nitrogen section in charge of Mr. T. C. Trescott. Cooperative work with the Association of Official Agricultural Chemists is also done looking to the improvement of the methods for making these determinations.

SPECIAL INVESTIGATIONS.

From time to time various lines of investigation are undertaken by the Bureau which do not come strictly within the general scope of any formally organized division or laboratory, and which require special training. Such investigations are conducted by experts reporting directly to the Chief of Bureau. The following lines of work may be mentioned under this head:

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PHYSIOLOGICAL CHEMISTRY.

The work done under this head includes two sections, one on animal and one on vegetable physiology, the former being in charge of F. C. Weber and the latter under J. A. Le Clerc. The work in the former section includes the conduct of the experimental food table for determining the effects on health and digestion of various food preservatives and food colors, together with experimental work to improve methods of analysis ordinarily employed in physiological work. It is the intention to extend this work to digestion experiments on the lower animals.

Metabolism and feeding experiments are conducted on the lower animals, using in the former organic and inorganic forms of phosphorus and sulphur, and in the latter various prepared foods and different carbohydrates to determine their nutritive value. Studies of enzymes and their application to chemical and physiological methods of analysis are also included in this line of work. Cooperative work for the Association of Official Agricultural Chemists on meat and fish is done in this laboratory, the chemist in charge acting as referee.

The investigations in vegetable physiological chemistry include cooperation with the various divisions of the Bureau of Plant Industry in studying the chemistry of growing plants, the composition of cereals and cereal products, grown under different conditions of environment, and with respect especially to moisture and fertilizing constituents, both in the greenhouse and in the fields. Other studies include the chemical, physical, and physiological changes taking place in barley during germination, the changes in the composition of cereals during storage, and methods of analysis related to such work.

BACTERIOLOGICAL CHEMISTRY.

This investigation, under the direction of George W. Stiles, jr., consists principally of the bacteriological examination of various food materials, together with the inspection of methods of handling and preparation, including milk, cream, ice cream, water, uncooked vegetables, and shellfish; also the bacterial content of fowls, fish, eggs, beef, game, etc., as affected by storage.

Considerable attention is devoted to testing the germicidal, anti-septic, and preservative value of certain drugs, chemicals, and fruit juices. Special consideration is also given to the identification and classification of the various bacteria, yeasts, and molds encountered in these investigations. Another line of work involves the examination of surgical dressings, gauzes, ligatures, etc., to determine their sterility. Cooperative work with other laboratories is done when required.

The investigation falls naturally into two parts, one dealing with the study of alcoholic ferments and the malorganisms associated with them in fruit musts, ciders, wines, and fruit by-products; the other with the composition of fruits and fruit juices and their fermented products, and the critical examination of the residue which is left in the marc or pomace as a partial waste product.

In the fermentation studies the pure cultures of the various organisms which occur in fruit musts or similar products are separated. These organisms are isolated and their growth activities studied as alcoholic ferments or as malferments which destroy the sugar, alcohol, acids, etc., which it is desired to produce.

The pure cultures which have given the greatest promise in Europe have been studied and compared with those isolated in this country. Having thus determined the vital activities, methods of control are studied, that the cultures of pure ferments may be utilized to produce the desired qualities in products manufactured from fruit juices, and either to suppress or destroy undesirable organisms. Cellar tests on the use of the pure cultures in comparison with each other and with unyeasted must are made, and also tests on the use of sulphur in the fermenting and handling of fruit juices in the cellar. These studies are conducted by William B. Alwood, enological chemist, with headquarters at Charlottesville, Va.

CANNING INVESTIGATIONS.

Extensive studies of the processes used in food preservation at canning factories are made in order to aid in the improvement of the general quality of canned goods and to lessen the losses due to defective methods. Cooperative work is also being carried on with the canners and dealers to determine the reasonable requirements for quality and quantity in the different grades of canned goods. Studies on the manufacture of tomato ketchup without the use of chemical preservatives have been continued, and the experiments have been extended to include the packing of shrimp and the curing of sea fish. The work is done under factory conditions and in lots of such size as to have an immediate commercial value. A. W. Bitting has charge of these investigations with laboratory headquarters at La Fayette, Ind.

MANUFACTURE OF DENATURED OR INDUSTRIAL ALCOHOL.

In accordance with the direct authorization of Congress that investigations be conducted "to demonstrate and illustrate the methods for the making of denatured alcohol on a scale suitable for utilization by the farmer, or associations of farmers," a small experimental still

has been erected at the Bureau of Chemistry, in which manufacturing experiments have been conducted using various materials and wastes, and a course of lectures given on the principles involved, the practice of distillation, methods of denaturing, applications of the finished product, and the laws and regulations governing its production. This work is still being continued by a number of experts acting under the direction of the Chief of Bureau, special attention being given to the cost of manufacture, amount of fuel used, etc.

INFLUENCE OF ENVIRONMENT ON COMPOSITION OF AGRICULTURAL PRODUCTS.

This Bureau is especially studying the influence of environment upon the chemical composition of wheat, barley, and the sugar and starch producing plants. The need of further study of these subjects is generally recognized and in its prosecution the Bureau has the active collaboration of a number of the State experiment stations as well as the cooperation of the Bureau of Plant Industry. Studies on wheat, barley, and sugar corn are in progress under the direct supervision of the Chief of Bureau.

Approved:

JAMES WILSON,

Secretary of Agriculture.

WASHINGTON, D. C., *July 1, 1909.*

[Cir. 14]

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No. 5. The Sugar Industry of the United States. By H. W. Wiley. 1885. Pp. 224, figs. 12, pls. 12, map. (Out of print.)

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No. 8. Methods and Machinery for the Application of Diffusion to the Extraction of Sugar from Sugar Cane and Sorghum, and for the Use of Lime and Carbonic and Sulphuric Acids in Purifying the Diffusion Juices. By H. W. Wiley. 1886. Pp. 85, figs. 24. (Out of print.)

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No. 26. Record of Experiments in the Production of Sugar from Sorghum in 1889 at Cedar Falls, Iowa; Rio Grande, N. J.; Morrisville, Va.; Kenner, La.; College Station, Md., and Conway Springs, Attica, Medicine Lodge, Ness City, Liberal, Arkalon, Meade, Minneola, and Sterling, Kans. By H. W. Wiley. 1890. Pp. 112. Price 10 cents. In hands of Superintendent of Documents only.

No. 27. The Sugar-Beet Industry: Culture of the Sugar Beet and Manufacture of Beet Sugar. By H. W. Wiley. 1890. Pp. 262. (Out of print.)

No. 28. Proceedings of the Seventh Annual Convention of the Association of Official Agricultural Chemists, held at the United States National Museum, August 28, 29, and 30, 1890. (Methods of Analysis of Commercial Fertilizers, Foods, and Feeding Stuffs, Dairy Products, Fermented Liquors, and Sugars.) Edited by H. W. Wiley. 1890. Pp. 238. (Out of print.)

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- No. 98. Drug Legislation in the United States. By L. F. Kebler, with the collaboration of E. T. Ragan. 1906. Pp. 217. Price 25 cents. (Out of print.)
- No. 98, revised. Part I. Drug Legislation in the United States. Revised to July 15, 1908. By L. F. Kebler, Chief, Division of Drugs. 1909. Pp. 343. Price 35 cents. Part II. Index, in preparation.
- No. 99. Proceedings of the Twenty-second Annual Convention of the Association of Official Agricultural Chemists, held at Washington, D. C., November 16, 17, and 18, 1905. Edited by H. W. Wiley. 1906. Pp. 211. Price 20 cents.
- No. 100. Some Forms of Food Adulteration and Simple Methods for their Detection. By W. D. Bigelow and B. J. Howard. 1906. Pp. 59. Price 10 cents.
- No. 101. The Lime-Sulphur-Salt Wash and Its Substitutes. By J. K. Haywood. 1907. Pp. 29. Price 5 cents.
- No. 102. Foreign Trade Practices in the Manufacture and Exportation of Alcoholic Beverages and Canned Goods. Summary of an Investigation made in Great Britain and Ireland, Germany, and France. By H. W. Wiley. 1906. Pp. 45. Price 10 cents.
- No. 103. Experimental Work in the Production of Table Sirup at Waycross, Ga., 1905, together with a Summary of the Four-Year Experiment on Fertilization of Sugar Cane. By H. W. Wiley. 1906. Pp. 38. Price 10 cents.
- No. 104. Food Legislation During the Year Ended June 30, 1906. By W. D. Bigelow. 1906. Pp. 53. Price 10 cents.
- No. 105. Proceedings of the Twenty-Third Annual Convention of the Association of Official Agricultural Chemists, held at Washington, D. C., November 14-16, 1906. Pp. 213. Edited by H. W. Wiley. 1907. Price 25 cents.
- No. 106. Cassava; Its Content of Hydrocyanic Acid, Starch, and Other Properties. By C. C. Moore. 1907. Pp. 30. Price 5 cents.
- No. 107. Official and Provisional Methods of Analysis of the Association of Official Agricultural Chemists (superseding Bulletins 46 and 65). Edited by H. W. Wiley. 1907. Pp. 230, figs. 11. (Out of print.)
- No. 107, Revised. 1908. Pp. 272, figs. 13. Price 20 cents.
- No. 108. Commercial Feeding Stuffs of the United States: Their Chemical and Microscopical Examination. By J. K. Haywood, Chief, Miscellaneous Laboratory, and H. J. Warner, Assistant Chemist, with the collaboration of B. J. Howard, Chief, Microchemical Laboratory. 1908. Pp. 94, pls. 6. Price 25 cents.
- No. 109. Some Technical Methods of Testing Miscellaneous Supplies, Including Paints and Paint Materials, Inks, Lubricating Oils, Soaps, etc. By Percy H. Walker, Chief, Contracts Laboratory. 1908. Pp. 48. Price 10 cents. (In hands of Superintendent of Documents only.)
- No. 110. Chemical Analysis and Composition of American Honeys. By C. A. Browne, Chief, Sugar Laboratory, including A Microscopical Study of Honey Pollen, by W. J. Young, Assistant, Microchemical Laboratory. 1908. Pp. 93, fig. 1, pls. 6. Price 30 cents.

No. 111. The Fermenting Power of Pure Yeasts and Some Associated Fungi. By Wm. B. Alwood, in Charge, Enological Chemical Investigations. 1908. Pp. 28, figs. 4. Price 5 cents.

No. 112. Food Legislation During the Year Ended June 30, 1907. Part I. Federal Laws and Laws of States and Territories, Alabama to New Hampshire, Inclusive. By W. D. Bigelow, Chief, Division of Foods. 1908. Pp. 155. Price 20 cents.

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No. 114. Meat Extracts and Similar Preparations, including Studies of the Methods of Analysis Employed. By W. D. Bigelow, Chief, Division of Foods, and F. C. Cook, Physiological Chemist. 1908. Pp. 56. Price 10 cents.

No. 115. A Preliminary Study of the Effects of Cold Storage on Eggs, Quail, and Chickens. By H. W. Wiley, Chief of Bureau, with the collaboration of M. E. Pennington, G. W. Stiles, jr., B. J. Howard, and F. C. Cook. 1908. Pp. 117, pls. 13. Price 40 cents.

No. 116. Proceedings of the Twenty-fourth Annual Convention of the Association of Official Agricultural Chemists, held at the Jamestown Exposition, Norfolk, Va., October 9-11, 1907. Edited by H. W. Wiley. 1908. Pp. 143. Price 20 cents.

No. 117. Commercial Sicilian Sumac. By F. P. Veitch, Chief, Leather and Paper Laboratory, including Notes on the Microscopical Examination of Sicilian Sumac and its Adulterants, by B. J. Howard, Chief Microchemical Laboratory. 1908. Pp. 32, pls. 3. Price 10 cents.

No. 118. Unfermented Apple Juice. By H. C. Gore, Assistant Chemist, Division of Foods. 1908. Pp. 23, figs. 4. Price 5 cents.

No. 119. Experiments on the Spoilage of Tomato Ketchup. By A. W. Bitting, Inspector, Bureau of Chemistry. 1909. Pp. 37, pls. 2, figs. 5. Price 10 cents. (In hands of Superintendent of Documents only.)

No. 120. The Feeding Value of Cereals, as Calculated from Chemical Analyses. By Joseph S. Chamberlain, Chief Cattle-Food and Grain Laboratory, Miscellaneous Division, in collaboration with the Bureau of Plant Industry. 1909. Pp. 64, tables 46. Price 10 cents.

No. 121. Food Legislation during the Year ended June 30, 1908. By W. D. Bigelow, Chief Division of Foods, with the collaboration of N. A. Parkinson. 1909. Pp. 85. Price 10 cents.

No. 122. Proceedings of the Twenty-fifth Annual Convention of the Association of Official Agricultural Chemists. Edited by H. W. Wiley, Chief Bureau of Chemistry. 1909. Pp. 248, figs. 6. Price 40 cents.

No. 123. Metabolism of Organic and Inorganic Phosphorus. By F. C. Cook, Physiological Chemist. 1909. Pp. 63, pls. 3. Price 15 cents.

No. 124. Chemical Studies of American Barleys and Malts. By J. A. Le Clerc, Physiological Chemist, and Robert Wahl, Special Agent. 1909. Pp. 75, frontispiece. Price 20 cents.

No. 125. The Canning of Peas. By A. W. Bitting, Food Inspector. 1909. Pp. 32, figs. 6. Price 10 cents.

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No. 127. Influence of Environment on the Composition of Sweet Corn. By M. N. Straughn and C. G. Church, Assistant Chemists, under the direction of H. W. Wiley, Chief of Bureau. In press.

Report 89 (Office of the Secretary). Durability and Economy in Papers for Permanent Records. A report submitted by H. W. Wiley, Chief Bureau of Chemistry, and C. Hart Merriam, Chief Bureau of Biological Survey, Committee on Paper for Departmental Use. Including Paper Specifications, by F. P. Veitch, Chief Leather and Paper Laboratory, Bureau of Chemistry. 1909. Pp. 51, figs. 4. Price 15 cents.

CIRCULARS.

No. 1. The Manufacture of Sorghum Sirup. Edited by G. L. Spencer. 1894. Pp. 3.

No. 2. Changes in and Additions to Methods of Analysis Adopted at the Thirtieth Annual Meeting of the Association of Official Agricultural Chemists, 1896. Pp. 6.

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No. 3. Needed Reforms in Fertilizer Inspection. Report of the committee appointed at the preliminary meeting of the official inspectors of fertilizers, 1897. Pp. 4. (Out of print.)

No. 3, revised. Proposed Reforms in Fertilizer Inspection Laws.

No. 4. Changes in and Additions to Methods of Analysis Adopted at the Thirteenth and Fourteenth Meetings of the Association of Official Agricultural Chemists. 1898. Pp. 10. (Out of print.)

No. 5. Chemical Examination of Canned Meats. By H. W. Wiley. 1898. Pp. 7. (Out of print.)

No. 6. Composition Chimique du Maïs et de ses Produits. Par M. H. W. Wiley. 1900. Pp. 13. (Out of print.)

No. 7, revised. Amended Methods Adopted at the Eighteenth Annual Convention of the Association of Official Agricultural Chemists. Edited by Wm. H. Krug, Referee on Foods and Feeding Stuffs. 1902. Pp. 3. (Out of print.)

No. 8. Official Methods for Analysis of Tanning Materials. Adopted by the Eighteenth Convention of the Association of Official Agricultural Chemists. Edited by H. W. Wiley. 1901. Pp. 2. (Out of print.)

No. 8, revised. Official Methods for Analysis of Tanning Materials. Adopted by the Nineteenth Convention of the Association of Official Agricultural Chemists. Edited by H. W. Wiley. 1902. Pp. 2.

No. 9. A Plan for Cooperating in the Study of Available Plant Food. By C. C. Moore. 1902. Pp. 8.

No. 10. Methods for Analysis of Insecticides and Fungicides. Edited by J. K. Haywood. 1902. Pp. 8. (Out of print.)

No. 10, revised. Methods of Analysis of Insecticides and Fungicides. Compiled by J. K. Haywood, Chief Miscellaneous Laboratory. 1905. Pp. 11.

No. 11. Preliminary Crop and Soil Data for the Cooperative Study of Available Plant Food. By C. C. Moore. 1903. Pp. 9. (Out of print.)

No. 12. Methods for the Investigation of Canceling Inks and Other Stamping Inks. By E. E. Ewell. 1903. Pp. 8. (Out of print.)

No. 12, revised. Methods for the Investigation of Canceling Inks and Other Stamping Inks. 1905. Pp. 6.

No. 13. Extracts from the Proceedings of the Association of Official Agricultural Chemists, 1903. (An advance circular giving the recommendations of referees as adopted, and the motions and appointments affecting the work of 1904.) Edited by H. W. Wiley. 1904. Pp. 14. (Out of print.)

No. 14. Organization of the Bureau of Chemistry. Revised to July 1, 1909. Pp. 30.

No. 15. Results of Borax Experiment. Digest of Bulletin No. 84, Part I, giving the plan of work and conclusions as to the effects of boric acid and borax on digestion and health. By H. W. Wiley, M. D. 1904. Pp. 27.

No. 16, revised to July 1, 1909. Officials Charged with the Enforcement of Food Laws in the United States and Canada. 1909. In preparation.

No. 17. The Useful Properties of Clays. By Allerton S. Cushman, Chemist, Division of Tests. 1904. Pp. 12.

No. 18. Suggestions to Importers of Food Products. By H. W. Wiley. 1904. Pp. 16.

No. 19, revised. Methods for the Detection of Renovated Butter. (Cooperative work, Association of Official Agricultural Chemists, 1905.) By G. E. Patrick, Referee on Dairy Products and Chief of Dairy Laboratory. 1905. Pp. 6.

No. 20. Extracts from the Proceedings of the Association of Official Agricultural Chemists, 1904. Edited by H. W. Wiley, Chief of Bureau. 1904. Pp. 19. (Out of print.)

No. 21. Proposed Regulations Governing the Labeling of Imported Food Products. By H. W. Wiley, Chief of Bureau. 1904. Pp. 2. (Superseded by F. I. D. 1-26.)

No. 22. Cooperative Work on the Titer Test, Association of Official Agricultural Chemists, 1904. By L. M. Tolman, Assistant Chemist, Division of Foods, and Associate Referee on Fats and Oils. 1905. Pp. 16. (Out of print.)

No. 23. Methods for the Examination of Maple Products. By Julius Hortvet, Associate Referee on Saccharine Products, Association of Official Agricultural Chemists. 1905. Pp. 8.

No. 24. Analysis of the Mexican Plant *Tecoma mollis* H. B. K. By L. F. Kebler and A. Seidell, Drug Laboratory. 1905. Pp. 6.

No. 25. Coloring Matters for Foodstuffs and Methods for their Detection. A preliminary report made to the Association of Official Agricultural Chemists. By W. G. Berry, Associate Referee on Colors. 1905. Pp. 40.

No. 26. Extracts from the Proceedings of the Association of Official Agricultural Chemists, 1905. Edited by H. W. Wiley, Chief of Bureau. 1906. Pp. 16.

No. 27. Cooperative Work on Fats and Oils, Association of Official Agricultural Chemists, 1906. By L. M. Tolman, Associate Referee on Fats and Oils. 1906. Pp. 6. (Out of print.)

No. 28. Provisional Methods for the Determination of Food Preservatives as Authorized by the Association of Official Agricultural Chemists, 1905. By W. D. Bigelow, Chief Division of Foods. 1906. Pp. 13.

No. 29. Changes in Provisional Methods for the Analysis of Foods and Additions Thereto, from 1902 to 1905. By W. D. Bigelow, Chief, Division of Foods. 1906. Pp. 20.

No. 30. Changes in Official Methods of Analysis and Additions thereto, 1899 to 1905. By H. W. Wiley, Chief, Bureau of Chemistry. 1906. Pp. 28.

No. 31. General Results of the Investigations Showing the Effect of Salicylic Acid and Salicylates Upon Digestion and Health. By H. W. Wiley, Chief, Bureau of Chemistry. 1906. Pp. 12.

No. 32. Extracts from the Proceedings of the Association of Official Agricultural Chemists, 1906. Edited by H. W. Wiley, Chief of Bureau. 1907. Pp. 14. (Out of print.)

No. 33. Report on Methods of Beer Analysis. By H. E. Barnard, Chemist, Indiana State Board of Health, and Associate Referee on Food Adulteration. 1907. Pp. 16.

No. 34. Examination of Papers. F. P. Veitch, Chief, Leather and Paper Laboratory. Pp. 10.

No. 35. Report on Colors: The Solubility and Extraction of Colors and the Color Reactions of Dyed Fiber and of Aqueous and Sulphuric Acid Solutions. By H. M. Loomis, Chemist, Pennsylvania Department of Agriculture, cooperating with the Referee on Colors, Association of Official Agricultural Chemists. 1907. Pp. 51.

No. 36. Chemical Methods for Utilizing Wood, including Destructive Distillation, Recovery of Turpentine, Rosin, and Pulp, and the Preparation of Alcohol and of Oxalic Acid. By F. P. Veitch. 1907. Reprint, 1908. Pp. 47.

No. 37. General Results of the Investigations Showing the Effect of Sulphurous Acid and Sulphites Upon Digestion and Health. By H. W. Wiley, Chief, Bureau of Chemistry. 1907. Pp. 18.

No. 38. Extracts from the Proceedings of the Association of Official Agricultural Chemists, 1907. Edited by H. W. Wiley, Chief of Bureau. 1908. Pp. 14.

No. 39. General Results of Investigations Showing the Effect of Benzoic Acid and Benzoates Upon Digestion and Health. By H. W. Wiley, Chief of Bureau. 1908. Pp. 15.

No. 40. Methods for the Analysis of Maple Products and the Detection of Adulterants, together with the Interpretation of the Results Obtained. By A. Hugh Bryan, in Charge, Sugar Laboratory. 1908. Pp. 13.

No. 41. Paper-Making Materials and their Conservation. By F. P. Veitch, Chief, Leather and Paper Laboratory. 1909. Pp. 23.

No. 42. General Results of the Investigations showing the Effect of Formaldehyde upon Digestion and Health. By H. W. Wiley, Chief of Bureau. 1908. Pp. 16.

No. 43. Extracts from the Proceedings of the Association of Official Agricultural Chemists. Edited by H. W. Wiley, Chief of Bureau. 1909. Pp. 16.

No. 19. Office of the Secretary. Standards of Purity for Food Products (Superseding Circulars 13 and 17), July 26, 1906. Pp. 19.

No. 21. Office of the Secretary. Rules and Regulations for the Enforcement of the Food and Drugs Act. Issued October 16, 1906; revised, May 23, 1908, and June 8, 1909. Pp. 20.

FARMERS' BULLETINS.

No. 3. Culture of the Sugar Beet. By H. W. Wiley. 1891. Pp. 24, figs. 9. (Out of print.)

No. 12. Nostrums for Increasing the Yield of Butter. By Harvey W. Wiley. 1893. Pp. 16. (Out of print.)

No. 52. The Sugar Beet: Culture, Seed Development, Manufacture, and Statistics. By H. W. Wiley. 1897. Pp. 48, figs. 24.

No. 52, revised. 1899.

No. 52, second revised edition. By G. L. Spencer. 1901.

No. 52, third revised edition. By A. H. Bryan. 1908. Pp. 47, figs. 18.

No. 90. The Manufacture of Sorghum Sirup. By A. A. Denton. 1899. Pp. 23, figs. 9. (Out of print.)

No. 131. Household Tests for the Detection of Oleomargarine and Renovated Butter. By G. E. Patrick. 1901. Pp. 12.

No. 135. Sorghum Sirup Manufacture. By A. A. Denton. Pp. 40, figs. 26.

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No. 146. Insecticides and Fungicides: Chemical Composition and Effectiveness of Certain Preparations. By J. K. Haywood. 1902. Pp. 16. (Out of print.)

No. 268. Industrial Alcohol: Sources and Manufacture. By H. W. Wiley, Chief, Bureau of Chemistry. 1906. Pp. 47, figs. 10.

No. 269. Industrial Alcohol: Uses and Statistics. By H. W. Wiley, Chief, Bureau of Chemistry. 1906, revised 1907. Pp. 32, figs. 10.

No. 359. Canning Vegetables in the Home. By J. F. Breazeale. 1909. Pp. 16, figs. 9.

REPORTS OF SUGAR-BEET INVESTIGATIONS.

[Out of print.]

Experiments with Sugar Beets in 1898. By H. W. Wiley. Published as a part of "Progress of the Beet-Sugar Industry in the United States in 1898." Pp. 131-155.

Experiments with Sugar Beets in 1899. By H. W. Wiley. Published as a part of "Progress of the Beet-Sugar Industry in the United States in 1899." Pp. 135-193.

Experiments with Sugar Beets in 1900. By H. W. Wiley. Published as a part of "Progress of the Beet-Sugar Industry in the United States in 1900." Pp. 123-171.

Analysis of the Sugar Beets Grown in Various States. By H. W. Wiley. Published as a part of "Special Report on the Beet-Sugar Industry in the United States." 1900. Pp. 135-141.

REPRINTS FROM BULLETINS.

Food Adulteration. By W. D. Bigelow and W. S. Sweetser. From Bul. No. 51. Pp. 117-135.

Memorial Exercises in Honor of the Late John A. Myers. Edited by H. W. Wiley. From Bul. No. 67. Pp. 65-74. (Out of print.)

Report of Cooperative Work on the Dalcian Titer Test. By L. M. Tolman. From Bul. No. 81. Pp. 65-72. (Out of print.)

Determination of Gliadin and Glutenin in Flour by the Fleurent-Manget Method. By Joseph S. Chamberlain. From Bul. No. 81. Pp. 118-125. (Out of print.)

Report on Soils. By C. G. Hopkins. From Bul. No. 90. Pp. 170-177.

Summary of Experiments on the Relation of Soil Acidity to Fertility. By F. P. Veitch. From Bul. No. 90. Pp. 183-187. (Out of print.)

Report on Insecticides, Fungicides, and Disinfectants, also the Deterioration of Bleaching Powder. By Bernard H. Smith. From Bul. No. 99. Pp. 26-35.

Determination of Water in Foods. By F. C. Weber. From Bul. No. 105. Pp. 58-65.

Report on Fats and Oils. By L. M. Tolman. From Bul. No. 105. Pp. 29-37.

Report on the Separation of Meat Proteids. By F. C. Cook. From Bul. No. 116. Pp. 44-51.

Fertilizer Legislation. By H. W. Wiley. From Bul. 116. Pp. 97-100. (Out of print.)

Cooperative Work on Headache Mixtures. By W. O. Emery. From Bul. 122. Pp. 100-103.

The Necessity for Animal Experimentation in Determining the Purity and Strength of Medicinal Preparations. By Wm. Salant. From Bul. 122. Pp. 103-105.

The Assaying of Alkaloidal Drugs. By C. E. Parker. From Bul. 122. Pp. 129-136.

The Macroscopy and Microscopy of Drugs. By H. H. Rusby. From Bul. 122. Pp. 136-140.

Thomas Slag. By J. B. Lindsey. From Bul. 122. Pp. 148-151.

Methods of Analysis of Distilled Spirits. By L. M. Tolman and W. E. Hillyer. From Bul. 122. Pp. 206-213.

REPRINTS FROM YEARBOOK OF DEPARTMENT OF AGRICULTURE.

Mineral Phosphates as Fertilizers. By H. W. Wiley. 1894. Pp. 177-192. (Out of print.)

Soil Ferments Important in Agriculture. By H. W. Wiley. 1895. Pp. 69-102. (Out of print.)

Potash and its Functions in Agriculture. By H. W. Wiley. 1896. (1897, reprint 1899.) Pp. 107-136. (Out of print.)

Every Farm an Experiment Station. By Erwin E. Ewell. 1897. (1898, reprint 1899.) Pp. 291-303. (Out of print.)

Utilization of Residues from Beet-Sugar Manufacture in Cattle Feeding. By Guilford L. Spencer. 1898. Pp. 213-220.

The Relation of Chemistry to the Progress of Agriculture. By H. W. Wiley. 1899. Pp. 201-258.

Use and Abuse of Food Preservatives. By W. D. Bigelow. 1900. Pp. 551-560.

The Selection of Materials for Macadam Roads. By Logan Waller Page. 1900. Pp. 349-356.

Influence of Environment on the Chemical Composition of Plants. By H. W. Wiley. 1901. Pp. 239-318. (Out of print.)

Analysis of Waters and Interpretation of the Results. By J. K. Haywood. 1902. Pp. 283-294. (Out of print.)

Chemical Studies of Some Forest Products of Economic Importance. By William H. Krug. 1902. Pp. 321-332. (Out of print.)

The Adulteration of Drugs. By Lyman F. Kebler. 1903. Pp. 251-258. (Out of print.)

Determination of Effect of Preservatives in Foods on Health and Digestion. By H. W. Wiley. 1903. Pp. 289-301. (Out of print.)

Detection of Cotton-Seed Oil in Lard. By L. M. Tolman. 1904. Pp. 359-362, pls. 4. (Out of print.)

Inspection of Foreign Food Products. By H. W. Wiley. 1904. Pp. 151-160. (Out of print.)

Table Sirups. By H. W. Wiley. 1905. Pp. 241-248, pls. 2.

Formaldehyde: Its Composition and Uses. By Bernard H. Smith. 1905. Pp. 477-482.

The Effect of Climatic Conditions on the Composition of Durum Wheat. By J. A. Le Clerc. 1906. Pp. 199-212.

The Preparation of Unfermented Apple Juice. By Herbert C. Gore. 1906. Pp. 239-246.

The Method of Enforcing the Food and Drugs Act. By W. D. Bigelow. 1907. Pp. 321-328.

Changes Taking Place in Chickens in Cold Storage. By M. E. Pennington. 1907. Pp. 197-206, pls. 7.

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- The Use of the Microscope in the Detection of Food Adulteration. By B. J. Howard. 1907. Pp. 379-384, pls. 4.
 The Manufacture of Flavoring Extracts. By E. M. Chace. 1908. Pp. 333-342, pls. 4.
 Plant Food Removed from Growing Plants by Rain and Dew. By J. A. Le Clerc and J. F. Breazeale. 1908. Pp. 389-402.
 Suitable Papers for Permanent Records. By F. P. Veitch. 1908. Pp. 261-266.
 Some Special Aspects of Chemical Investigations. Compiled in the Bureau of Chemistry. 1908. Pp. 558-563.

REPRINTS FROM ANNUAL REPORTS OF DEPARTMENT OF AGRICULTURE.

Reports of the Chemist, 1890 to 1908, inclusive. (Reports for 1892 to 1896, and for 1904, are out of print.)

NOTICES OF JUDGMENT.

N. J. Nos. 1-82, May 2, 1908, to June 30, 1909. Index to list is as follows:

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	N. J. No.		N. J. No.
Apple cider. See Cider.		Honey:	
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Joseph Fallert Brewing Co.....	51	C. Deterding.....	11
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Mme. Yale's Skin Food, etc.:		Sulphur, liquid:	
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FOOD INSPECTION DECISIONS.

F. I. D. 1-39 practically concern imported foods only and were not issued under the food and drugs act, June 30, 1906. (Pp. 46.) Out of print.

F. I. D. 40. Filing Guaranty. 41. Approval of Labels. 42. Mixing Flours. 43. Relabeling of Goods on hand. (Pp. 4.)

F. I. D. 44. Scope and Purpose of Food Inspection Decisions. 45. Blended Whiskies. (Pp. 3.)

F. I. D. 46. Fictitious Firm Names; also F. I. D. 46, as amended. 47. Flavoring Extracts. 48. Substances Used in the Preparation of Foods. (Pp. 5.)

F. I. D. 49. Time Required to Reach Decisions on Different Problems Connected with the Food and Drugs Act, June 30, 1906. 50. Imitation Coffee. 51. Coloring of Butter and Cheese. 52. Form of Label. 53. Formula on the Label of Drugs. (Pp. 5.)

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